REMARKS

Upon entry of this amendment, claim 19 will be amended, whereby claims 19-23 will remain pending. Claim 19 is the sole independent claim.

Applicants note that in order to advance prosecution of the application, and without expressing any agreement or acquiescence with the rejections of record, independent claim 19 has been amended to even further define Applicants' invention in accordance with the originally filed application. Support for the amendments to Applicants' claim 19 appears in the originally filed application, for example, at page 2, beginning at line 28, and the Examples including Examples 1, 2 and 5. Moreover, the specification is amended herein to explicitly include the recitation therein. Accordingly, no prohibited new matter is introduced by the present amendment.

Reconsideration and allowance of the application are respectfully requested.

Discussion Of Telephone Interview

Applicants express appreciation for the courtesies extended by the Examiner during an October 5, 2004 telephone interview with Applicants' representative Arnold Turk wherein the rejections of record were discussed. During the interview, the language of claim 19 as included in the present amendment was discussed with the Examiner. Moreover, reference was made to the disclosure in the originally filed specification, especially page 2, beginning at line 28, and Examples 1, 2 and 5 in Table 1, with respect to the language of amended

claim 19. The Examiner indicated that the amendment presented herein is in accordance with the originally filed disclosure and would not be rejected as containing new matter.

Still further arguments were presented regarding allowability of amended claim 19 over the prior art, the Examiner would not make any commitment regarding allowability of the amended claims, and indicated that he would need to review the prior art of record as well as perform a further search of the prior art prior to making any commitment regarding patentability of the claimed subject matter.

Still further, the Examiner indicated that the amendment would not be entered after final rejection, and that a Request for Continued Examination should be filed to submit the amendment.

Arguments presented during the interview are included in the remarks herein.

Objection To Amendment And Rejection Of Claims 19-23 Under 35 U.S.C. 112, First Paragraph

The Amendment filed July 15, 2004 is objected to and rejected as including new matter because it is asserted that "a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 15% of an average thickness of the resistance heating body" is not supported by the original disclosure.

In response, to this ground of objection/rejection, Applicants note that the specification and claims have been amended herein to recite that the ceramic heater comprises a ceramic substrate and a resistance heating body formed on a surface thereof,

wherein the resistance heating body is formed on a face of the ceramic substrate opposite to a heating face thereof and a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body.

As discussed with the Examiner during the above-noted telephone interview, this language is supported in the originally filed disclosure, for example, at page 2, beginning at line 28, and the Examples including Examples 1, 2 and 5 including a scattering of a thickness of the resistance heating body within a range of ±15% of an average thickness. As noted above, during the above-noted interview, the Examiner indicated that the proposed amendment is supported by the originally filed disclosure and would not be subject to a new matter objection/rejection.

In view of the above, the objection/ rejection should be withdrawn.

Response To 35 U.S.C. 103(a) Rejections

Applicants note that the following rejections are set forth in the Office Action:

(1) Claims 19-21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 11-040330 ("Masakazu") in view of Kawada et al., JP 073007377. The rejection alleges that Masakazu discloses a ceramic heater with a substrate made of a carbide or nitride ceramic with a thickness of 0.5-5 mm and a resistance heating body formed of a plurality of circuits on a face of the substrate opposite to the heating face. The rejection admits that

Masakazu does not disclose a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 15% of an average thickness of the resistance heating body. However, the REJECTION alleges that Kawada discloses a surface roughness of a heating layer on a ceramic heater being greater than 5 μm Rmax.

The rejection further contends that Masakazu discloses average thickness of the resistance heating body to be 1-20 μm but could be changed with a 15% maximum, the roughness may be 0.15 to 3 μm. The rejection contends that this falls within acceptable disclosed level of roughness in the claim as sell as in Kawada since Rmax is disclosed 5 μm and there will be many areas having actually smaller roughness.

The rejection concludes that it would have been obvious to have made the surface of the resistance heating body rough so that it may have good bonding with the base and cool quickly after the heating is turned off.

(2) Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masakazu in view of Kawada, and further in view of U.S. Patent No. 5,591,269 to Arami et al. ("Arami"). The rejection once again admits that Masakazu does not disclose the resistance heating body formed on the insulating layer. However, the rejection once again alleges that Arami discloses a resistance heating body formed on an insulating layer. Therefore, the rejection once again concludes that it would have been obvious to provide a heating resistance body on top of insulating layer so as not to have short circuiting, specially at high temperature when the resistance of the ceramic base gets low.

In response, Applicants respectfully submit that independent claim 19 is directed to a ceramic heater comprising a ceramic substrate and a resistance heating body formed on a surface thereof, wherein the resistance heating body is formed on a face of the ceramic substrate opposite to a heating face thereof and a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body.

Thus, amongst the features recited in independent claim 19, the claim includes that a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body. Such structure allows adjustment of removal of heat in the atmospheric gas around the resistance heating body to control a scattering of heat generating amount of the resistance heating body to obtain uniformity of the temperature of the heating face.

As discussed throughout Applicants' originally filed application, such as at page 2, the first full paragraph:

> The inventors have made examinations with respect to the aforementioned problem in the technique disclosed in JP-A-11-251040 and confirmed that the reason of ununiform temperature is due to the facts that the distance between the heating face of the substrate and the resistance heating body is too small, and the scattering of the thickness in the resistance heating body is large and/or the surface roughness of the resistance heating body becomes large over a certain standard and as a result the invention has been accomplished. That is, according

> to the invention, a resistance heating body is formed on a surface opposite to a heating face of a substrate, and the resistance heating body is housed within a particular scattering range and/or a surface roughness of the resistance heating body is adjusted to a particular surface roughness range.

Moreover, the Examiner's attention is directed, for example, to page 4, the first two full paragraphs wherein it is disclosed that:

> And also, when the surface roughness of the resistance heating body is less than 0.05 μm as Rmax, the surface is too smooth and an atmosphere gas is easily fluidized and locally gets heat of the resistance heating body and hence the temperature of the heating face for the wafer or the like becomes easily ununiform. While when the surface roughness exceeds 100 μm as Rmax, the thickness of the resistance heating body becomes scattered and the temperature of the heating face for the wafer or the like becomes ununiform. That is, when the surface roughness of the resistance heating body is too large or too small, the temperature of the heating face can not be uniformized.
>
> In other words, the reason why the scattering and surface roughness of the thickness of the resistance heating body are adjusted is to prevent the fact that when they exceed upper limits, the scattering of the resistance value of the resistance heating body becomes large and hence the scattering of the temperature distribution of the heating face for the wafer or the like becomes large.

Applicants note that when Rmax is less than 0.05 μm the atmospheric gas flows to remove heat and hence a drop in temperature is caused. Moreover, when Rmax exceeds 100 μm, the scattering of the thickness of the resistance heating body becomes large and the temperature of the heating face becomes non-uniform. Further, when a scattering of a thickness of the resistance heating body exceeds 15% of the average thickness, the temperature of the heating face becomes non-uniform.

With respect to the above, the Examiner's attention is directed to the Examples and Comparative Examples set forth in Applicants' specification. As can be seen from a review of Table 1 on page 23, Examples 1, 2 and 5 have values of surface roughness of the resistance heating body as Rmax and a scattering of a thickness of the resistance heating body of an average thickness in conformance with the values recited in Applicants' Claim 19, whereas Examples 3 and 4, and comparative Examples 1-6 are not in conformance therewith. In particular, in Example 1, the surface roughness of the resistance heating body is 0.5 μm as Rmax and a scattering of a thickness of the resistance heating body is 15% of an average thickness; in Example 2, the surface roughness of the resistance heating body is 0.5 μm as Rmax and a scattering of a thickness of the resistance heating body is 5% of an average thickness; and in Example 5, the surface roughness of the resistance heating body is 0.06 μm as Rmax and a scattering of a thickness of the resistance heating body is 1.3% of an average thickness. In contrast, Example 3 has a scattering % of 30, Example 4 has a scattering % of 40, Comparative Example 1 has a scattering % of 55, Comparative Example 2 has a scattering % of 65, Comparative Example 3 has an Rmax of 0.04 μm, Comparative Example 4 does not have an indicated Rmax value, Comparative Example 5 has a scattering % of 55, and Comparative Example 6 has a scattering % of 55.

As can been seen from a review of Table 1, the temperature difference in Example 1 is 5°C, in Example 2 is 3°C, and in Example 5 is 2°C. In contrast, the temperature difference in Example 3 is 6°C, in Example 4 is 6°C, in Comparative Example 1 is 10°C,

in Comparative Example 2 is 15°C, in Comparative Example 3 is 10°C, in Comparative Example 4 is 13°C, in Comparative Example 5 is 10°C, and in Comparative Example 6 is 6°C. Therefore, it is seen that Examples 1, 2 and 5 which correspond to the subject tatter recited in claim 19 are excellent in the uniformity of temperature distribution in the heating face as compared to examples that do not correspond to the subject matter recited in claim 19.

Still further, as previously noted by Applicants, Masakazu discloses a heater in which a heating body formed by sintering metallic particles is arranged on a plate body of nitride ceramic or carbide ceramic, and also discloses printing of a conductor paste on the plate-shaped ceramic and heating. However, Masakazu does not disclose adjusting the scattering of thickness of the heating body and surface roughness. Therefore, a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body is not taught or suggested in Masakazu.

Furthermore, as also previously noted by Applicants, Example 1 of Masakazu substantially corresponds to Comparative Example 1 in which with respect to the average thickness of 5 μm, Rmax is 3.5 μm and is more than 15% (2.5 μm) of the average thickness. In Comparative Example 1, the temperature difference is as large as 10°C, so that the temperature uniformity of the heating face is poor as compared with that of Example 1.

From the above, it is apparent that the present invention solves the problem inherent to the invention disclosed in Masakazu and there is no teaching or suggestion to arrive at Applicants' invention from Masazaku, especially when Masazaku does not teach or suggest the problem and/or any solution thereof.

The deficiencies of Masazaku are not overcome by the remaining documents utilized in the rejections.

Initially, Applicants note that in view of the diverse disclosures of the documents utilized in the rejection one having ordinary skill in the art would not have been motivated to combine their disclosures in any manner to arrive at Applicants' invention. Moreover, even if the disclosures were combined, Applicants' invention would not be at hand.

Kawada discloses the heating body of Rmax = 5 μm at column 4, line 37, but does not teach or suggest that Rmax is made to what extent of the thickness of the heating body. Further, Kawada does not recognize that when a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body excellent uniformity of temperature distribution of a substrate can be obtained as in Applicants' invention. Thus, Kawada does not overcome any deficiency of Masakazu, and any combination of Kawada and Masakazu would not arrive at a ceramic heater comprising a ceramic substrate and a resistance heating body formed on a surface thereof, wherein the

resistance heating body is formed on a face of the ceramic substrate opposite to a heating face thereof and a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body.

Arami is utilized in the rejection of claim 22 in an attempt to establish that it would have been obvious to one having ordinary skill in the art to provide a heating resistance body on top of insulating layer so as not to have short circuiting, especially at high temperature when the resistance of the ceramic base gets low. Thus, Arami is not utilized in the rejection to address any of the above-noted deficiencies of Masakazu and Kawada. Therefore, whether of not one having ordinary skill in the art would have been motivated to combine the disclosure of Arami with that of Masakazu modified by Kawada, the presently claimed invention would not be at hand.

Therefore, it is seen that any combination of the documents utilized in the rejections of record does not teach or suggest a ceramic heater comprising a ceramic substrate and a resistance heating body formed on a surface thereof, wherein the resistance heating body is formed on a face of the ceramic substrate opposite to a heating face thereof and a scattering of a thickness of the resistance heating body is within a range of ±15% of an average thickness, and a surface roughness of the resistance heating body is within a range of 0.05 μm - 100 μm as Rmax and not more than 50% of an average thickness of the resistance heating body. Moreover, Applicants' invention achieves

advantageous results that are not taught or suggested in the documents utilized in the rejections.

Still further, claim 20 further patentably defines that the ceramic substrate is a carbide or nitride ceramic.

Still further, claim 21 further patentably defines that the ceramic substrate has a thickness of not more than 25 mm.

Still further, claim 22 further patentably defines that an insulating layer of an oxide ceramic is formed on the surface of the ceramic substrate and the resistance heating body is formed on a surface of the insulating layer.

Still further, claim 23 further patentably defines that the resistance heating body is constructed by two or more circuits.

According, the rejections of record are without appropriate basis and should be withdrawn.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection of record, and allow each of the pending claims.

Applicants therefore respectfully request that an early indication of allowance of the application be indicated by the mailing of the Notices of Allowance and Allowability.

Should the Examiner have any questions regarding this Response, the this application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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